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Federal Aviation
Administration

Eligibility of Noise Abatement Proposals for Grants-in-aid under the Airport Improvement Program

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Report of the Administrator
of the Federal Aviation
Administration to the United
States Congress pursuant to
Section 301 (e) of Public
Law 100-223

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16. Abstract <p>This report is in response to the requirement in section 301(e) of the Airport and Airway Safety and Capacity Expansion Act of 1987 (Public Law 100-223). The Federal Aviation Administration was directed to study noise abatement proposals by airport operators and local governments, to identify those proposals which are ineligible for grant-in-aid assistance under existing laws or administrative policies, and to recommend whether such laws and policies should be modified to make such proposals eligible for Federal assistance.</p> <p>→ This report summarizes the provisions of existing Federal laws, regulations, administrative policies and grant program procedures which relate to funding of noise abatement projects. The report also presents historical data on Federally assisted noise compatibility projects and funding levels in fiscal years 1982 - 1987. A literature search was conducted and parties involved with airport noise compatibility planning and project implementation were consulted to identify proposals which are currently not eligible for grant assistance and the reasons for their ineligibility. The report concludes with recommendations to make eligibility criteria more flexible and to provide clearer guidance to parties involved with noise compatibility project formulation, evaluation and implementation. <i>Keywords: ds</i></p>			
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FEDERAL AVIATION ADMINISTRATION

REPORT TO CONGRESS

ELIGIBILITY OF NOISE ABATEMENT PROPOSALS
FOR GRANTS-IN-AID UNDER
THE AIRPORT IMPROVEMENT PROGRAM

I. EXECUTIVE SUMMARY.

Section 301(e) of the Airport and Airway Safety and Capacity Expansion Act of 1987 (1987 Act) directs the Federal Aviation Administration (FAA) to conduct a study of noise abatement proposals under consideration by airport operators and local governments. The purpose of the study is to identify those proposals which are not currently eligible for Federal assistance because of existing law or administrative policy and to determine whether or not such proposals should be made eligible for funding. The FAA is further directed to report to Congress on the results of the study and to recommend whether existing law and administrative policy should be modified to make additional noise abatement proposals eligible for Federal assistance.

Eligibility determinations related to noise compatibility projects are based on Federal laws, regulations, administrative policies and procedures, and technical criteria. These provide sufficient authority and flexibility to provide financial support to a broad variety of noise abatement proposals. Nearly \$425 million was issued in grants to implement noise compatibility projects in fiscal years 1982 through 1987. About 90 percent of those funds were used for acquisition of noise impacted property or for sound insulation of residences and public buildings. The remaining \$38.6 million was granted for other projects ranging from construction of noise abatement runways to revision of building codes. An additional \$17 million was used to assist airport operators in conducting noise compatibility planning.

Noise abatement proposals evaluated in this report were identified by reviewing House of Representatives Report 100-123, by reviewing noise compatibility programs prepared by airport operators, and by consulting with parties active in airport noise compatibility planning and project implementation. Such proposals may have been disapproved in conjunction with formal noise compatibility programs or in connection with other initiatives to reduce adverse noise impacts, or they may never have been submitted for any formal FAA review.

This study found that many noise abatement proposals were ineligible for Federal assistance because: they involved no capital costs, they could not be implemented by an eligible grant

recipient, or they were not approved noise abatement measures in a noise compatibility program prepared by an airport operator.

This study recommends that, for the benefit of airport operators and residents around airports, the FAA should revise certain administrative policies and technical criteria used to evaluate noise abatement project eligibility. In addition, better guidance should be developed to assist all parties involved in formulating and evaluating noise abatement proposals. The study makes the following specific recommendations:

- sound insulation projects may include the installation of air conditioning, subject to a limitation on allowable costs equivalent to that for a positive ventilation system;
- allow limited exceptions to the noise exposure criterion used to determine eligibility for noise insulation projects;
- revise guidance on the interior noise level criterion used to determine eligibility for noise insulation;
- adopt the findings of a concurrent FAA study regarding a more comprehensive review of noise compatibility planning to determine whether an alternative interior noise measurement system should be used to determine the eligibility and scope of noise insulation proposals, and revise eligibility criteria accordingly; and
- revise, expand, and clarify guidance to FAA field offices on eligibility criteria to facilitate evaluation of noise abatement proposals.

All of these recommendations can be implemented by the FAA under the authority of existing laws and regulations.

II. EXISTING STATUTORY AUTHORITY AND ADMINISTRATIVE POLICIES.

The authority, policies, criteria and procedures governing FAA determinations and actions related to noise compatibility programs and project implementation are found in Federal laws and regulations, and in FAA directives. The relevant provisions of these documents are discussed briefly below.

Aviation Safety and Noise Abatement Act.

The Aviation Safety and Noise Abatement (ASNA) Act of 1979 is the principal law supporting Federal efforts to identify and reduce noncompatible land uses around civil airports in the United States. It established, or caused to be established, standardized terms and measurement systems to describe aviation noise and to identify compatible land uses around airports. In

addition, it is the principal catalyst for airport noise compatibility planning and for implementation of noise abatement proposals recommended in those plans.

Section 102 of the ASNA Act required the FAA to establish, by regulation, standard terms and definitions related to certain civil airport noise and land use compatibility issues. Specifically, the FAA was directed to:

- (1) establish a single system of measuring noise at airports which reliably relates various noise levels with the reactions of people to noise;
- (2) establish a single measurement system to determine the exposure of individuals to noise resulting from airport operations which incorporates noise intensity, duration, frequency and time of occurrence; and
- (3) identify land uses which are normally compatible with various noise exposure levels.

One of the main features of the ASNA Act is that it permits an airport operator to prepare noise exposure maps which describe the existing and forecast noise exposure levels and which identify noncompatible land uses around the airport. An airport operator who has submitted a noise exposure map and related information to the Secretary of Transportation may also submit a noise compatibility program (NCP). The NCP sets forth the measures which the airport operator has taken or proposes to take to reduce existing noncompatible land uses and to prevent the introduction of additional noncompatible land uses within the area covered by the noise exposure map. The ASNA Act notes that such measures may include, but are not limited to:

- preferential runway systems;
- airport use restrictions;
- noise barriers and acoustical shielding, including soundproofing;
- noise abatement flight procedures; and
- acquisition of land and interests therein.

The ASNA Act also directs the Secretary to approve any such NCP (other than those measures related to flight procedures for noise abatement) if the measures to be undertaken meet certain statutory criteria. The Administrator is authorized by the ASNA Act to approve or disapprove noise abatement flight procedures, and the Secretary has delegated authority to the Administrator to approve other measures in the NCP.



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In addition, the ASNA Act authorizes the issuance of grants to prepare noise exposure maps and NCP's and for any project to carry out approved noise compatibility program measures. Noise compatibility planning grants may be made only to eligible airport operators. Grants to carry out noise compatibility projects may be made to airport operators and to units of local government in areas surrounding such airports if the FAA determines that they have the capability to carry out those projects.

Grant authority was also extended to projects in an NCP which was prepared prior to the enactment of the ASNA Act or the promulgation of its implementing regulations. Such a prior program must be determined to be substantially consistent with the goal of reducing noncompatible land uses and to further the purposes of the Act. The 1987 Act also authorized the FAA to issue grants for noise insulation projects in public buildings used primarily for educational or medical purposes without the preparation of a noise compatibility program if they are determined to be adversely affected by airport noise.

Title 14, Code of Federal Regulations, Part 150.

Designations of noise measurement systems, compatible land uses, and policies and procedures for evaluating noise exposure maps and noise compatibility programs are contained in Title 14, Code of Federal Regulations, Part 150. The regulation designates the systems to be used for measuring noise and for calculating noise exposure, and it establishes a uniform methodology for the preparation of airport noise exposure maps which includes use of those systems. Part 150 also provides for the use of computer models to develop standardized noise contour maps depicting noise exposure levels around an airport, and it designates which of several land uses are compatible and noncompatible with various noise exposure levels.

After thorough study and interagency and intergovernmental consultation, the FAA designated the standard system for airport noise measurement to be the A-weighted sound pressure level in decibels (dBA). The dBA measurement system has generally been accepted as one which has a highly reliable relationship between projected noise exposure and the surveyed reactions of people to noise. In addition, it has long been an established term in the noise measurement field, is commonly used by experts in describing the intensity of individual noise events, and is easily understood by the general public.

Similar study and consultation preceded the selection of a noise measurement system for determining the exposure of individuals to airport noise. It was concluded that the long range effects of exposure to airport noise correlate well with several cumulative noise exposure measures. Each of these provides a single number which is equivalent to the cumulative acoustical

energy associated with fluctuating sound levels over a specified time period.

The unit selected to represent the time and energy components of cumulative noise exposure is the day-night sound level (Ldn). Ldn is the 24-hour average sound level, in A-weighted decibels, obtained after the addition of ten decibels to sound levels occurring between 10 P.M. and 7 A.M. The purpose of the ten decibel penalty is to account for increased annoyance to noise during late night and early morning hours. Yearly Ldn, the average day-night sound level over 365 consecutive days, is the standard measurement system used to describe noise exposure of individuals around airports and to designate compatible and noncompatible land uses around the airport.

Designation of the noise systems described above depended largely on easily quantifiable acoustical factors such as measurable sound energy, duration, and the sound attenuation values that various construction materials provide for building occupants. Identifying land uses which are compatible with various noise exposure levels, however, is less precise because there are several qualitative nonacoustical factors which must be considered. These include the type of human activity associated with specific land uses, the differing responses of individuals to the same noise environment, individual attitudes about the noise source, the extent to which an activity is disturbed or disrupted by various noise levels, the cost of achieving lower average sound levels, and other factors.

The adverse impacts of aviation noise on land use have been studied extensively by several Federal agencies, foreign governments and independent researchers. The specific impacts studied include the effects of noise on speech intelligibility, annoyance and interruption of human activities, including sleep disturbance. Following exhaustive review of the existing research and thorough intergovernmental and interagency consultation, the FAA developed generalized land use categories and designated which of those land uses are normally compatible with various noise exposure levels. These land use designations incorporate the results of numerous statistical surveys involving the reactions of large groups of people to noise. They may not, however, accurately represent the reaction of a particular individual to an actual noise environment.

Under Federal land use guidelines contained in Part 150, all land uses are considered to be compatible with noise levels less than 65 Ldn. Residential land uses and places of public assembly (hospitals, schools, churches, etc.) are generally considered incompatible with noise levels of 65 Ldn or more. (As a frame of reference, noise exposure in an urban residential environment with no recurring disruptive noise events is approximately 60 Ldn; the noise exposure level adjacent to a very busy commercial

airport may exceed 85 Ldn.) Commercial, recreational and industrial land uses are considered less noise sensitive, i.e., they are compatible with higher noise exposure levels. These designations, however, do not constitute a Federal determination that any particular land use is acceptable under Federal, state or local law. Final land use determinations rest with local officials.

In addition, Part 150 incorporates the statutory criteria set forth in the ASNA Act and used by the FAA to evaluate NCP's prepared and submitted by airport operators. The Administrator approves noise compatibility programs, or portions of programs, if they are consistent with the following criteria:

- the program measures are reasonably consistent with achieving the goals of reducing existing noncompatible land uses around the airport and of preventing the introduction of additional noncompatible land uses;
- the program measures would not reduce the level of aviation safety, would not derogate the requisite level of protection for aircraft, their occupants and persons and property on the ground, would not adversely affect the efficient use and management of the national airspace;
- the program measures, if implemented, would not create an undue burden on interstate or foreign commerce;
- the program measures are not unjustly discriminatory;
- the program measures, to the extent practicable, meet both local needs and needs of the national air transportation system, considering tradeoffs between economic benefits derived from the airport and the noise impact;
- the program provides for its revision if made necessary by a revision of the noise exposure map; and,
- the program measures would not adversely affect any other powers and responsibilities of the Administrator prescribed by law or any other program, standard or requirement established in accordance with law.

Airport and Airway Improvement Act.

While the ASNA Act authorizes the issuance of grants for noise compatibility projects, the enabling legislation for all such grants, in addition to airport planning and development grants, is the Airport and Airway Improvement Act of 1982 (AAIA). The AAIA originally required that at least eight percent of the funds made available in any fiscal year for airport planning and development be obligated during such fiscal year for airport

noise compatibility planning and projects. The 1987 amendment raised this provision to ten percent. From 1982 through 1987, the total amount required to be set aside for noise compatibility planning and projects was slightly more than \$371 million. In fiscal years 1988 and 1989, those amounts are \$127 million and \$140 million, respectively.

Federal financial assistance for airport planning, airport development, and noise compatibility projects is available to airport operators and units of local government as authorized under the AAIA. The Federal share of allowable costs for noise compatibility planning is the same as allowed for an airport development project at that airport under the AAIA. The Federal share for noise compatibility projects was originally set by the ASNA Act at 80 percent. That provision was modified by the 1987 Act to be either 80 percent or the Federal share which would be applicable to a development project at that airport, whichever is greater.

Eligible noise compatibility projects include elements of an FAA-approved noise compatibility program or prior program under the ASNA Act. Funds granted for such projects are credited against the ten percent "set-aside" noted above for noise compatibility planning and projects. As noted above, the 1987 Act also authorizes the FAA to provide funds to soundproof schools and hospitals which are determined to be adversely affected by airport noise. These specific soundproofing projects are not required to be included in a Part 150 or prior noise compatibility program. (Projects to mitigate the environmental impacts of airport development are also eligible for assistance under the AIP when they are included as mitigation commitments in an environmental impact statement or a finding of no significant impact. Grant funds issued for such projects, however, are not credited to the ten percent set-aside specified for noise compatibility projects.)

Federal Aviation Administration Order 5100.38.

Formal guidance on the eligibility of prospective grantees and all projects under the AAIA, including those for noise compatibility, is contained in FAA Order 5100.38, Airport Improvement Program (AIP) Handbook. The AIP Handbook borrows language from the ASNA Act which states that all provisions applicable to grants for airport development projects under the AIP are also applicable to grants for noise compatibility projects, unless they are determined to be unnecessary or inconsistent with the purposes of that Act. Such provisions are based on policies and regulations applicable to all Federal departments and agencies, and on legislation addressed specifically to aviation and other transportation programs. Provisions applicable to project eligibility and allowable costs for all projects under the AAIA include, but are not limited to, the following requirements:

- the project is reasonably consistent with plans of planning agencies for development in the area;
- the project will be completed without undue delay;
- the project does not involve construction, alteration or repair of public parking facilities for passenger automobiles, aircraft hangers, or any part of an airport building unless specifically identified as eligible;
- completion of the appropriate environmental process for the scope and nature of anticipated environmental impacts;
- costs must be necessary for accomplishment of the project and they must be in conformity with plans and specifications and other grant documents and conditions;
- costs must be determined to be reasonable;
- costs must be incurred after the date of execution of the grant agreement, except project formulation costs;
- allowable project costs may include costs attributable to master planning and noise compatibility planning, related consultant studies, purchase of certain equipment and facilities, construction, and similar one-time capital investments; and
- costs related to personnel training or to operation and maintenance of airport or noise compatibility facilities are not allowable costs for grants under the AAIA.

The AIP Handbook also contains more detailed eligibility criteria for noise compatibility projects. For example, a primary requirement applicable to such projects is that they be located in areas where the noise exposure attributable to airport operations is 65 Ldn or more, consistent with Federal guidelines on compatible and noncompatible land uses. In addition, projects in higher noise exposure areas (i.e., 75 Ldn or greater) are accorded higher priority than those where noise exposure is less (i.e., 65 to 75 Ldn).

Current eligibility criteria for noise insulation projects are based in part on research which indicates that, where outdoor noise levels are 65 Ldn or more, residential structures should provide 20 decibels or more noise level reduction for residents. Normal residential construction techniques provide about 20 decibels of reduction from outside to inside, so, in areas where the exterior noise exposure levels are less than 65 Ldn, residential uses are generally considered compatible without additional noise attenuation. Research has also demonstrated that most people do not perceive a change in the noise environment that is less than

five decibels. Consequently, the interior noise level threshold for residential noise insulation projects has been set at 50 Ldn, and the project should be designed to reduce that level by at least 5 decibels.

Noise insulation proposals for noncompatible schools and similar public use buildings where noise exposure is 65 Ldn or more are evaluated on the basis of the interior single event noise levels because such buildings are generally not used during nighttime hours, and because oral communication is essential to achieving the purpose for which the buildings are intended. An average sound level of 45 dBA, with a single event maximum of 55 dBA, is the nominal design objective, and, as with residences, an additional 5 decibels is added to establish the threshold criterion for eligibility.

III. NOISE COMPATIBILITY PROJECTS FUNDED UNDER THE AAIA.

Prior to 1980, the FAA was authorized to issue grants for noise projects only for land acquisition and noise compatibility projects located on the airport. Consequently, although approximately \$99.26 million was issued in grants to implement noise compatibility projects from fiscal year 1976 through 1981, all but \$1.03 million was for land acquisition. The ASNA Act expanded that eligibility dramatically by authorizing the issuance of grants to implement any noise abatement measure in an NCP prepared by an airport operator and approved by the FAA under Part 150.

As a result of the expanded grant authority and the emphasis on comprehensive study under the ASNA Act, noise abatement proposals have become much more innovative and diverse. Most NCP's prepared by airport operators now include actions to reduce noise at the source (the aircraft), actions to change the design or operation of the airport, and construction or land use changes off the airport to eliminate noise sensitive land uses or to mitigate adverse noise impacts. Specific noise compatibility measures may be implemented by regulatory or administrative action (noise-based landing fees, revised flight tracks, etc.), through construction (a new runway or structural sound insulation), or by purchase of equipment or property.

It should be emphasized that prior to the ASNA Act, local government units which were not airport operators were not eligible to receive grants for noise compatibility projects under the AAIA. Under the ASNA Act, however, entities such as public school districts, hospital districts, municipalities and counties which do not operate airports may sponsor and implement approved noise compatibility projects with Federal assistance. Over \$10 million has been issued in grants to such local government units since this innovative provision was adopted.

During fiscal years 1982 through 1987, 320 grants were issued under the AAIA for projects to carry out approved measures in noise compatibility programs or prior programs. Funding for these projects was in excess of \$424.6 million. This is in addition to approximately \$17 million for noise compatibility planning at 136 airports. Total Federal funds issued for noise compatibility planning and projects during that period were \$441.6 million. That is approximately 9.15 percent of the aggregate amount available for obligation under the AAIA, and about \$70 million more than the statutory requirement. General project categories and total funding in each category are as follows:

<u>Project Category</u>	<u>Funding (million)</u>
Acquisition of land or interests in land and associated relocation	\$327.64
Sound insulation of dwellings and public buildings	58.38
Runway and taxiway construction, including associated land acquisition, lighting and navigational aids	30.22
Noise monitoring systems and equipment	4.89
Noise barriers	2.26
Miscellaneous	1.23
Total	<u>\$424.62</u>

Acquisition of noise impacted properties allows the airport operator or another local government agency to eliminate residential and other noncompatible land uses from areas of significant noise exposure. Subsequent disposal of those properties, while retaining an aviation easement or a similar land interest which allows overflights and their related noise, can ensure continued compatibility without limiting activity at the airport. More than three-quarters of the AIP funds used for noise compatibility projects in the 1982-1987 period were for acquisition of land or interests in land and relocation assistance to residents and businesses. The Inspector General, Department of Transportation, has raised issues concerning the effectiveness of land acquisitions in reducing noncompatible use of noise impacted areas. Recommendations in that report are under review.

An alternative that has been recommended frequently in areas where local officials and residents determine that noise levels are significantly high, but that land use patterns should not change, is the insulation of structures to reduce interior noise

levels. Residences, schools, hospitals, and some other public use buildings may be eligible for grants under the AAIA for such noise insulation projects. About 14 percent of all funding for noise compatibility projects from 1982 through 1987 was for sound insulation of dwellings and other structures.

The third major project category, runway and taxiway construction, accounted for an additional seven percent of the noise compatibility project funds during the 1982-1987 period. (These projects also include associated work, such as land acquisition needed for construction, lighting, and connecting taxiways.) Implementation of these projects results in shifting noise away from sensitive land uses toward more compatible areas.

Approximately two percent of the noise compatibility project grant funds issued during this period was for projects other than those described above. These include noise monitoring equipment, noise barriers, and a variety of innovative projects such as ground marker lights to help aircrews follow an approved visual noise abatement track at night, area-specific planning studies, development of a noise attenuation section of local building codes, and transaction assistance.

Transaction assistance involves noncompatible residential land use in areas where local government officials have determined, through consultation with all affected parties, that the residential use will be continued. That local land use determination is coupled with a program to help existing occupants sell their homes and move out of the area. The assistance may take several forms, but most often involves payment of sales costs for the seller. The end results are that the existing occupant is able to sell and move from a noise impacted area, the new owner acquires the property with full disclosure of the noise environment, and the airport operator retains an avigation easement over the property to permit continued overflights and their attendant noise. In most cases, sound insulation is installed in the houses prior to reoccupancy.

IV. NOISE ABATEMENT PROPOSALS UNDER CONSIDERATION BY AIRPORT OPERATORS AND LOCAL GOVERNMENTS WHICH ARE NOT CURRENTLY ELIGIBLE FOR FEDERAL ASSISTANCE.

Information about noise abatement proposals which are currently not eligible for Federal assistance was obtained from several sources. First, those measures specifically cited in House of Representatives Report 100-123 were evaluated to determine whether they are eligible, and if not, whether they should be. In addition, officials at several airports, including each of those named in the House Report, were contacted to invite their suggestions on innovative noise abatement concepts which should be eligible for Federal assistance.

Next, all Part 150 noise compatibility programs submitted to the FAA were screened to identify those measures proposed by airport operators and subsequently disapproved by the FAA. As discussed above, approval of a noise abatement proposal in an NCP is normally a prerequisite for eligibility.

Finally, all FAA regional offices were surveyed to identify as many noise abatement proposals as possible which may have been considered either individually, on an ad hoc basis, or during the course of a noise compatibility planning study but not included in an NCP submitted by the airport operator. Of primary interest were those measures which were dropped from consideration as a result of FAA advice to the effect that they either would not be approved in a noise compatibility study, or would not be eligible for Federal assistance.

The noise abatement proposals and suggestions which emerged during this study have been categorized as specific measures which can be evaluated on the basis of their noise abatement merits, measures which are grouped collectively by origin or type, and proposals to change the criteria and thresholds used to determine eligibility.

Specific Noise Abatement Proposals.

The specific noise abatement proposals identified in this study and discussed here include only those projects involving capital investments. Several of these are similar to projects which have previously been implemented with Federal assistance. Additional specific measures which are not eligible for grant assistance because they are not approved measures in an NCP, or because they do not involve capital outlays, are discussed below as generic noise abatement proposals.

Voluntary acquisition of properties and relocation of residents. Airport operators have developed a wide variety of land acquisition proposals to alleviate adverse noise impacts near airports. These include conventional land acquisition and relocation, voluntary acquisition by the airport operator or local government upon the request of a property owner, and financial assistance to homeowners during a conventional private party sale transaction. The first two are discussed in this section. The third, often called transaction assistance, was noted in section III, above, and is discussed further in a later section.

Land acquisition and relocation are frequently proposed in areas around an airport where noise exposure is 75 Ldn or more, and where local communities have agreed that the land should be redeveloped into other uses which are compatible with noise levels in the area. The details of each program are developed locally, but generally involve acquisition of all noncompatible

properties in designated areas by the airport operator or another local government unit.

Acquisition usually proceeds according to a local implementation plan based on redevelopment potential, severity of noise impact, homeowner applications, the availability of Federal and local funds, and other considerations. Although such programs are generally voluntary, in that property owners may offer their property for sale at any time, local officials may establish purchase priorities within the acquisition area. Also, in certain circumstances, local officials may determine that the use of eminent domain is necessary or locally advantageous.

If Federal funds are sought in conjunction with any land acquisition and relocation program, the details of the transactions are governed by the provisions of Title 49, Code of Federal Regulations, Part 24. This interim rule was recently promulgated to implement the Uniform Relocation and Real Properties Acquisition Policies Act, and is applicable to all Federal agencies. Under Part 24, the purchase price is established by an appraisal of the fair market value, subject to appeal, and the relocated residents are authorized to receive relocation benefits and other assistance if:

- the acquisition is carried out under the threat of eminent domain, including amicable agreements under the threat of such power, or
- where there is an intended, planned, or designated project area, and all or substantially all of the property within that area is eventually intended to be acquired.

Land acquisition and relocation proposals have been approved in numerous noise compatibility programs, both under Part 150 and as prior programs under the ASNA Act. Funding for these proposals is discussed in section III, above. No change in existing laws or regulations is necessary to continue implementing these proposals.

A somewhat different voluntary acquisition program is one in which the airport operator or local government agrees to acquire the property of residents who wish to relocate out of a noise impacted area. These are often called purchase assurance programs, and are distinguished from conventional land acquisition and relocation programs by the following factors:

- under purchase assurance, no specific site or property needs to be acquired;
- the property to be acquired is not in an area where all or substantially all of the properties will be acquired; and

- the airport operator will not acquire the property if negotiations fail to result in an amicable agreement.

Purchase assurance is most often proposed in areas where the noise exposure level is between 65 Ldn and 75 Ldn and where residential land use is planned to continue without major rezoning or redevelopment. It generally involves an agreement by an airport operator or other local government unit to purchase the homes of residents living in designated noncompatible areas around the airport at the residents' request. The residents are then free to relocate to any area of their choice and the property is resold for continued residential use with the reservation of an avigation easement on behalf of the airport operator. The proposal may also include installation of structural noise insulation prior to reoccupancy.

As with conventional acquisition and relocation, described above, the provisions of Part 24 govern the procedures and benefits related to purchase assurance projects. Under Part 24, however, the airport operator may determine that acquisition under a purchase assurance program is a "voluntary transaction." In that case, homeowners who request that the airport operator acquire their property under a purchase assurance program would not receive relocation payments. Most airport operators favor this approach in areas where noise exposure is less than 75 Ldn because the lower implementation costs are seen as appropriate for the strongly voluntary nature of the program. Additionally, because costs and administrative requirements are less, purchase assurance programs can be implemented to reach a larger number of residents more quickly.

Several airport operators have included purchase assurance proposals in their noise compatibility programs and all that were described in sufficient detail have been approved by the FAA. Although these proposals have included only voluntary transactions as described above, it should be noted that an airport operator may submit a noise compatibility program which includes full benefits under Part 24 in conjunction with a purchase assurance measure. If properly justified and approved under Part 150 by the FAA, costs associated with such benefits are eligible under the AAIA.

Part 24 appears to offer enough flexibility to permit airport operators and local communities to develop noise compatibility programs best suited to their needs. For areas where acquisition and redevelopment of all noncompatible properties is considered best, all benefits under Part 24 are required to be made available to persons displaced by the acquisition. Conversely, in areas where only some of the properties will be acquired, the airport operator and the community can design the program to the mutual benefit of all parties. Consequently, no changes in existing laws, regulations or administrative policies

are recommended in connection with the purchase assurance concept.

Air conditioning in conjunction with noise insulation. Air conditioning is by far the most frequently suggested work item which respondents feel should be made eligible for grant funding. FAA administrative policy has held that a properly designed positive ventilation system provides adequate air movement and exchange for a comfort level equivalent to that obtained with open windows. The cost of such a positive ventilation system is allowable in conjunction with the installation of acoustical insulation. Air conditioning, however, has not been considered eligible because, although it provides additional comfort, it is unnecessary to achieve the noise reduction benefits of the project.

The rationale for including air conditioning is that ventilation alone is not adequate in a sealed structure during warm weather. It is assumed that school staff and residents will tend to open windows for fresh air, thereby negating the benefits of noise attenuating materials which have been installed. In addition, it is argued that airport operators need to build as much community support as possible to allow the airport to continue to operate and grow. Air conditioning provides an extra measure of benefit, thereby reducing community opposition to the airport.

The FAA has reviewed arguments both opposing and favoring the eligibility of air conditioning costs, and has concluded that its current administrative policy should be modified. The revised policy permits the installation of air conditioning in lieu of a continuous positive ventilation system if requested by the recipient. Allowable costs for air conditioning are limited to the equivalent cost for an adequate ventilating system. Additional costs attributable to acquisition and installation of air conditioning equipment may be shared in any way that is acceptable to project sponsors and recipients. Sponsors should also present recipients with information about operating and maintenance costs for the additional equipment, as well as reduced noise attenuation benefits, if any, during periods when air conditioning is not used. This guidance has been disseminated to FAA field facilities.

Other noise insulation methodologies. Two proposals come under this heading. One involves residential sound insulation to establish a "quiet room" in a home rather than the more common practice of installing whole-house insulation. The other emphasizes the application of new materials or techniques to accomplish noise reduction goals.

In proposing the quiet room concept, residents express a preference for greater noise reduction in a specific room where family activities are concentrated, while other parts of the home

are provided with less noise attenuation. This concept has not as yet been included in any airport operator's proposed noise compatibility program, although informal inquiries have been made about its eligibility. At least one airport operator has agreed to test such a program to evaluate resident reaction and cost, and it is expected that the results will determine whether it becomes a recommendation in the airport operator's NCP. No Federal assistance was sought for this demonstration program.

Other insulation methodologies may also mean the use of new materials or techniques to achieve lower interior noise levels. New structural components and mechanical equipment, for example, periodically replace earlier materials because they perform better or cost less. Because Federally-assisted noise insulation programs are relatively new, it is expected that there will be significant advances in both noise attenuation materials and techniques in the future.

These noise insulation methodologies are currently eligible for noise compatibility funds under the AAIA, subject to certain criteria. One prerequisite is that such measures be approved in an airport operator's NCP, as is true for all noise compatibility projects. Another is that interior and exterior noise levels be at or above the thresholds established by the AIP Handbook. In addition, the materials and procedures should conform to accepted standards and practices. (See the discussions below on eligibility without an approved NCP, on revised noise level thresholds, and on demonstration projects.) No change in existing legal authority or administrative policy is necessary to continue the eligibility of these specific proposals.

Programs intended to assure receipt of full fair market value upon the sale of residential properties for those desiring to relocate out of a noise zone (generally termed "transaction assistance" programs). Transaction assistance, described briefly in section III, is an eligible noise abatement measure if it is an approved measure in an airport operator's NCP. It is similar to other acquisition programs in that it permits a homeowner to sell property in a noise impacted area with some financial assistance from the airport operator. The assistance usually provides that the airport operator or other local government unit pays costs associated with the transaction, such as the real estate sales commission, so that the seller receives the full sale price. A primary difference between transaction assistance and other acquisition programs is that neither the airport operator nor any unit of local government acquires title to the property during the course of the transaction.

The provisions of Part 24 are not applicable to transaction assistance programs because the transactions are between private parties and no Federal agency or Federally-assisted local agency acquires the property. If, however, such a program does not

satisfy local noise compatibility objectives, the airport operator should formulate other proposals, including conventional land acquisition and purchase assurance, to achieve those objectives. An airport operator's noise compatibility program may, in fact, include a variety of measures involving a various forms of acquisition and assistance. Because this flexibility already allows airport operators the ability to tailor their NCP's to fit local needs, the FAA does not recommend any changes to Federal laws, regulations or administrative policies in connection with such proposals.

Development of noise abatement flight procedures. One suggestion called for the use of grant funds to assist in the development of noise abatement flight procedures. Civil flight procedures, for any purpose, are developed, tested and approved for use by the FAA, and costs associated with their development are essentially FAA operational costs. The FAA has consistently maintained the policy that funds authorized and appropriated for the Airport Improvement Program not be used to pay such operational costs. No change in this policy is recommended.

Noise Abatement Proposals Grouped by Origin or Type.

Several noise abatement proposals which were identified in this study are ineligible for grant-in-aid assistance for reasons unrelated to their specific noise abatement potential. In some cases, they are nearly identical to measures which have been implemented with Federal assistance at other locations.

Noise abatement proposals submitted and disapproved by the FAA in conjunction with Part 150 noise compatibility programs. An airport operator's proposed noise compatibility program may contain as many as 50 individual measures to reduce or mitigate noise around the airport. The FAA evaluates and approves or disapproves each measure in accordance with the standards and criteria set forth in Part 150. A measure which is disapproved under Part 150 is subsequently ineligible for a grant as a noise compatibility project under the AAIA.

A measure in a noise compatibility program will be disapproved if the FAA determines that it would adversely affect aviation safety and efficiency, if it is ineffective as a noise control or mitigation action, or if it is unduly burdensome or unjustly discriminatory. A proposed measure may also be disapproved if the airport operator does not provide enough information on which the FAA can base a reasonable determination that the measure meets the criteria in the ASNA Act and Part 150.

As of May 1, 1988, the FAA had reviewed and approved 34 airport noise compatibility programs and one revised program. (An additional 86 noise studies are under FAA review or have completed one stage of FAA evaluation.) Although each of the 34 NCP's

gained overall approval, there were in each case some measures which were disapproved. In all, 63 proposed noise mitigation measures have been disapproved under Part 150.

Two-thirds of the measures disapproved under Part 150 are not at issue in this study because they would have involved the implementation of flight procedures, airport use restrictions or pricing mechanisms, or airport tenant lease provisions. The question of eligibility is immaterial with respect to these proposals because they do not involve capital outlays on the part of the airport operator or local government, the only possible exception being minor administrative costs.

Twenty-one noise mitigation measures which were disapproved by the FAA under Part 150 would have been eligible for funding had they been approved. Each of these would have involved some capital or construction cost and could have been sponsored by an eligible airport operator or unit of local government. In 16 instances FAA disapproved a proposal because it was not described in sufficient detail to determine the noise abatement benefits associated with its implementation. The remaining five measures could not be justified on the basis of noise abatement benefits, although each did have merit for capacity enhancement or improved airport efficiency. (Some of these have since been funded as airport development projects.)

Section III described projects in various noise mitigation categories which have been funded under the AAIA. Each of the 21 measures just discussed can be placed in one of those project categories. Consequently, had these measures been submitted with more detail, or had they been shown to reduce noncompatible land uses, it is likely that they would have been approved in the airport operators' noise compatibility programs and would have been eligible for Federal funding. Furthermore, any such proposal which was originally determined to lack sufficient detail on which to base approval may be resubmitted with additional information for reconsideration by the FAA. In either case, approval in the context of an airport operator's NCP would then satisfy a prerequisite for funding eligibility under the AAIA.

Noise compatibility measures proposed in an NCP for which FAA approval is pending, and proposals not in an airport operator's NCP. These proposals, measures awaiting NCP approval and measures not in an NCP, initially appear to be attractive candidates for more liberal eligibility rules. Measures not in an NCP may have been considered during program development, may have been overlooked during NCP preparation, or may be ad hoc proposals by an airport operator who has not engaged in comprehensive noise compatibility planning.

A proposal considered but not included in an airport operator's NCP may have been eliminated because of FAA advice,

projected high costs, marginal benefits, or other local considerations. Later, however, the same measure may seem to have attractive benefits and the airport operator or the community may wish to implement it. Such proposals may be similar to projects funded at other locations and usually considered eligible, or they may be for measures which are usually determined to be ineligible.

A noise abatement proposal may also appear spontaneously, without prior study. Noise insulation or minor land acquisition, for example, have been shown to be effective and eligible measures in several locations. It can be argued that, under certain circumstances, these measures should be eligible immediately without protracted study. Similarly, some respondents suggested that if a measure has been studied and recommended in the airport operator's NCP, it should be eligible immediately without having to wait for FAA to approve the NCP.

The FAA does not agree that noise compatibility proposals should be made eligible without comprehensive study and FAA approval for several reasons. First, the FAA has consistently interpreted the language in both the ASNA Act and the AAIA to mean that, except for certain specified exceptions, grant funds for noise mitigation projects are authorized only to implement approved NCP's.

Second, most airport operators that complete a detailed noise study develop better programs than those that quickly accept the first apparent solution. They benefit by incorporating a broad array of noise mitigation proposals which do more than focus on a single aspect of the problem. Such studies present a clearer picture of how future actions may proscribe future operations or growth at the airport, of tradeoffs between airport capacity and land use compatibility, and of the benefits attributable to a variety of noise compatibility alternatives. In addition, airport neighbors and airport users generally develop an increased tolerance for, and understanding of, each other's problems during the course of a comprehensive study.

Another reason that proposals should be included in approved programs is that all airport operators should be subject to the same rules in order to qualify for Federal assistance. Sponsors who have conducted detailed noise studies and produced NCP's approved by the FAA should not have to compete for limited grant funds with others seeking to implement similar projects without comparable study.

In addition, Congress has recently authorized the issuance of grants to insulate public schools and hospitals in high noise areas around airports without an approved NCP. Although this provision appears to provide a timely solution for a limited number of buildings, it is too early to judge the ultimate level

of interest in this provision. Therefore, the FAA does not recommend expanded eligibility of projects without the study and consultation originally contemplated by the ASNA Act at this time.

Demonstration projects. Demonstration projects have traditionally been considered not eligible for grants under airport grant-in-aid programs. This is because such projects, as interpreted by the FAA, are intended to test or demonstrate the efficacy of a novel design, a new product or an unproven technique. Projects funded under the AAIA are instead required to use proven methods and materials to achieve specified objectives. The FAA does not recommend that the policy regarding such demonstration projects be changed.

Airport operators and other local agencies, however, may propose a demonstration project for a different purpose. They often wish to demonstrate the effectiveness of a noise mitigation measure, such as noise insulation, on a small scale to build support for a large scale neighborhood program. That type of project, described as phase one of a neighborhood noise insulation program, for example, avoids the conflicting definition, is currently approvable under Part 150, and would, in most cases, be eligible for Federal funding. The FAA will advise its field offices which administer the grant-in-aid program to be aware of this distinction and to advise airport operators accordingly.

Proposals involving no construction or capital outlays. Some respondents suggested that the costs associated with publication of community newsletters, rental of aviation easements, and the operation and maintenance of noise abatement navigational aids installed with grant funds be eligible for Federal grants. The FAA views these as administrative and ongoing operational costs which are prohibited under the AAIA, just as they are for airport development items. The FAA proposes no change in this provision.

Proposals to implement noise abatement measures in areas where noise exposure is less than 65 Ldn. Several respondents suggested that certain projects, such as land acquisition and noise insulation, should be eligible, even in areas where noise exposure is less than 65 Ldn. Current guidance generally limits eligibility for noise insulation and land acquisition to areas where existing or future noise exposure is 65 Ldn or more. A substantial number of airport operators, however, indicated that they receive noise complaints from those who live and work in areas normally considered compatible.

The FAA has studied this matter and has concluded that the existing 65 Ldn exterior noise level criterion is appropriate for land acquisition and most residential noise insulation proposals. In most cases cited by airport operators and FAA staff, a rela-

tively small proportion of the residential population exposed to noise levels less than 65 Ldn has registered noise complaints, even when questioned in surveys. This is consistent with the statistical data from earlier research on the reactions of people to various noise exposure levels.

In addition, the land area and resident population increase exponentially as one moves outward from an airport into areas of lower noise exposure. Extending grant eligibility in this direction would substantially increase the number of potential noise insulation and land acquisition candidates in areas of low noise exposure and tend to divert funds from more seriously impacted areas.

Another reason to continue using 65 Ldn as the noise exposure level criterion for eligible land acquisition is that there are other effective measures which can be implemented locally to prevent development of potentially sensitive land uses. New zoning regulations and building codes, for example, have been drafted in some communities as a result of noise compatibility program recommendations. The FAA encourages local officials and community representatives to consider such measures when preparing an NCP, and will continue to do so.

Under Part 150, however, airport operators may substitute local determinations of land use compatibility for the Federal guidelines in Part 150. Several airport operators have already submitted noise exposure maps to FAA under Part 150 which include noise contours and noncompatible land use designations in areas where noise exposure is less than 65 Ldn. These designations are based on explicitly documented locally determined land use compatibility values. The noise compatibility programs accompanying these noise exposure maps have, in some cases, recommended remedial noise mitigation projects outside the 65 Ldn. Such projects have been approved by FAA under Part 150. FAA funding eligibility has, however, to date been based on consistency with Federal guidelines, i.e., noncompatible areas within a 65 Ldn.

The FAA believes, upon further consideration, that funding guidelines should allow eligibility for those occasional projects outside a 65 Ldn contour to achieve local land use compatibility. Such projects may be specifically justified in an airport operator's Part 150 NCP or on an ad hoc basis with respect to the soundproofing of schools and hospitals which are eligible without an approved Part 150 program. Two examples have come to light in connection with the potential eligibility of noise compatibility measures which may be recommended in an NCP.

One exception to Federal land use compatibility guidelines may be applicable in tropical areas where local building practices produce structures in which the exterior to interior noise level reduction is much less than 20 decibels. Similarly, for a

noise abatement project in a public school located where noise exposure is less than 65 Ldn, airport operator's documentation should determine that the average sound level during normal school hours is 45 dBA or more and single event noise levels attributable to airport operations exceed 55 dBA.

Proposals to Revise the Noise Level Criteria used to Determine Eligibility for Certain Noise Abatement Measures.

Several airport operators noted that a large proportion of the residential structures in high noise areas around their airports are ineligible for noise insulation because measurements have shown that interior noise levels are below the criterion level of 50 Ldn. The measurements also show that those residents are subjected to a large number of noise events daily which disrupt conversation and other activities in their homes. These conditions have been documented at locations where the outside noise exposure level is as high as 75 Ldn.

Proposal to revise the interior noise exposure level criterion for noise insulation projects. One problem, as viewed by airport operators and local residents, is that the interior noise exposure level criterion (50 Ldn) established in the AIP Handbook is too stringent. They argue that, in light of past FAA studies which concluded that residential interior noise levels should be 45 Ldn or less, the FAA should not require an additional 5 Ldn penalty in order to qualify for noise insulation. Rather, the criterion should be revised downward to 45 Ldn to make all dwelling units eligible for Federal assistance if their interior noise levels reach or exceed that threshold of compatibility.

During the course of this study, it was learned that a technical change should be made in the criterion used to determine the eligibility and proper scope of a proposed noise insulation project. The Ldn measurement system was devised to describe general land use compatibility over a range of outdoor noise exposure levels, but was not intended to determine the compatibility or noncompatibility of interior noise environments. For example, the table of land use compatibility in Part 150 lists residential land use as noncompatible in areas where noise exposure is 65 Ldn to 70 Ldn. It is further noted, however, that residential use may be compatible if residential structures in that zone achieve a noise level reduction (NLR) of 25 decibels from outdoors to indoors.

Based on the above information, the FAA will make a technical revision to the AIP Handbook stating that eligibility for noise insulation will be based on outdoor Ldn and the noise level reduction achieved by the structure without the addition of a five decibel penalty factor. That portion of the guidance which requires a project to produce at least five decibel improvement

will be retained, however. This revision is expected to result in a substantial increase in the number of residences eligible for sound insulation. For example, in a residential area recently screened for eligibility, the proportion of eligible dwellings increased from 54 percent to 98 percent under the revised criteria.

Proposal to allow an alternative noise level measurement to determine eligibility for noise insulation. Another point of concern expressed by airport operators is that the Ldn measurement system does not adequately address adverse noise impacts under certain circumstances, and that single event noise levels should also be considered. It was noted, for example, that in some areas where the noise exposure is more than 75 Ldn, the application of local thermal insulation standards have already reduced interior noise exposure levels to 45 Ldn or less. Nevertheless, reactions of residents in such areas are similar to those of residents in much noisier dwelling environments.

In an earlier FAA publication (Advisory Circular 150/5020-1, Noise Control and Compatibility Planning for Airports), it was noted that, although the "cumulative noise metric (Ldn) is useful as an indicator that soundproofing may be required in a particular area it is recommended that additional analysis via single event maximum sound level ... be used to determine the necessity (and/or eligibility) for soundproofing." Other research has suggested various measurement systems to more fully describe the adverse effects of aviation noise on the indoor environment. These systems generally emphasize a specific noise characteristic which is particularly disruptive to a given human activity.

Examples of other noise measurement systems are:

- speech interference level, frequently used to evaluate noise problems in classrooms by measuring the acoustical energy within the frequency range encountered in normal speech;
- sound exposure level, which incorporates both the energy and duration of a noise event, but does not include additional weight for noise events which occur at night;
- sound equivalent level, a measure used to describe cumulative noise energy over a given length of time, e.g., one hour, six hours, or any other time period of interest; and
- time above, a measure of the aggregate length of time that a given noise level, usually specified in dBA, is exceeded.

It is considered beyond the scope of this study to select one or more of these alternative noise measurement systems as a

replacement for, or alternative to, the noise level reduction criterion discussed above. However, the FAA is currently conducting another study at the direction of Congress to determine whether the noise compatibility planning and program development procedures under Part 150 should be revised to take into account special circumstances at certain airports. It is expected that this study will also address the use of single event noise measurement systems. The findings of that study, to be completed June 30, 1989, will be incorporated in a subsequent revision of the AIP Handbook, if appropriate.

Proposal to Expand and Clarify Existing Guidance.

Although it was not mentioned specifically in any of the data gathered for this report, it is clear that FAA field offices need better and more thorough guidance on the eligibility of specific noise compatibility proposals. Several projects which were assumed by FAA field personnel and airport operators to be ineligible, such as construction of a new runway for noise abatement, have, in fact, been funded at other locations. The FAA intends to promptly revise, expand and clarify the AIP Handbook so that such inconsistencies are avoided in the future.

V. RECOMMENDATIONS.

The results of this study indicate that existing legislation provides the FAA with adequate authority to make eligible those noise abatement proposals which have merit and are recommended in an airport operator's noise compatibility program. Therefore, the FAA recommends no changes to existing law for that purpose.

The study also indicated that the FAA should reconsider its administrative policies on several criteria for evaluating noise abatement proposals. Recommendations to address those issues and the actions FAA has taken to implement them are set forth below.

- * Recommendation: Allow installation of air conditioning with noise insulation projects. FAA action: Revised guidance on the eligibility of air conditioning in conjunction with noise insulation projects has been developed and distributed to FAA offices. Air conditioning equipment may be installed in connection with a positive ventilation system at the recipient's request. The allowable cost under the AAIA is limited to the cost of an adequate ventilation system. This guidance applies to projects under an approved Part 150 program or publicly owned educational and medical facilities as authorized under the 1988 amendments.
- * Recommendation: Allow funding for certain projects outside the 65 Ldn. FAA action: The AIP Handbook will be revised to explain the circumstances under which noise abatement

proposals are eligible in areas where noise exposure is less than 65 Ldn. Specifically, noise abatement proposals in an airport operator's noise compatibility program which are approved by the FAA under Part 150 and which are outside the 65 Ldn are eligible if the airport operator, in consultation with local officials, has determined that such land use is not compatible with noise levels resulting from operation of the airport. Proposals to provide soundproofing for medical and educational facilities which are not included in a noise compatibility program, and which are located in areas where noise exposure is less than 65 Ldn, will be eligible when accompanied by documentation sufficient to allow the FAA to determine that the facility is adversely affected by airport noise.

- * Recommendation: Revise the interior noise level criterion used to establish eligibility for residential and school noise insulation. FAA action: Guidance on the evaluation of noise insulation proposals will be revised to specify the design objective as a given amount of noise level reduction (NLR) to be achieved in a structure. In addition, the NLR threshold of 20 dBA where noise exposure is 65 Ldn will be established as the basic eligibility criterion. The effect of this revision will be to increase substantially the number of structures qualifying for Federal assistance under the AAIA.
- * Recommendation: Conduct further study, including the FAA study of Part 150 currently underway, to determine whether and to what extent an alternative noise measurement system should be used to evaluate noise insulation proposals. FAA action: Based on the results of the FAA's current study of noise compatibility planning under Part 150, the FAA will determine whether to revise existing guidance to permit the use of alternative noise measurement systems to evaluate the eligibility and proper scope of noise insulation proposals. Should such a revision be made, it is expected that the number of structures eligible for Federal assistance will increase substantially.
- * Recommendation: Provide more comprehensive guidance on the eligibility of noise compatibility projects. FAA action: The FAA will promptly revise, expand, clarify and distribute to its field offices that portion of the Airport Improvement Program Handbook which provides guidance related to the eligibility of noise compatibility proposals, including the appropriate description of "demonstration projects" and changes due to the recommendations described above.

The revisions to eligibility criteria described above will be published as changes to the AIP Handbook, and will not require legislative or rulemaking action.